International Journal of Women's Health

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ORIGINAL RESEARCH

Determinants of Sub-Optimal Birth Spacing in Gedeo Zone, South Ethiopia: A Case–Control Study

This article was published in the following Dove Press journal:
International Journal of Women's Health

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Background: Birth spacing is key in ensuring the health of mothers and their children as well as determining population growth. Most of the mothers in developing nations including Ethiopia have been practicing short inter-birth intervals. There is a paucity of studies concerned with suboptimal birth spacing among women in reproductive age in the study area.

Purpose: This study aims to identify the determinants of sub-optimal birth spacing among reproductive-age women in Gedeo zone, South Ethiopia.

Materials and Methods: A community-based unmatched case–control study was undertaken among 814 reproductive-age women in Gedeo zone, South Ethiopia from October 1 to November 30, 2018. Cases were women practiced suboptimal/short birth intervals (<33 months), whereas controls were women practiced inter-birth intervals of 33 months and more. A structured interviewer-administered questionnaire was used. A stratified, two-stage cluster sampling technique was used. EpiData version 3.1 and SPSS version 22 were used for data entry and analysis, respectively. Bivariate and multivariable logistic regression analyses were computed. P-value <0.05 was considered as statistically significant. All ethical procedures were considered.

Results: Women's educational status, AOR (95% CI) =0.6 (0.43, 0.96), age at first marriage, AOR (95% CI) = 0.9 (0.85, 0.99), distance from the nearest health facility, AOR (95% CI) = 1.4 (1.04, 1.94), wealth index, AOR (95% CI) = 4.1 (2.66, 6.19), and postnatal care utilization after the previous birth, AOR (95% CI) = 0.4 (0.25, 0.53) were statistically significant with suboptimal birth spacing.

Conclusion: Women's educational status age at first marriage, distance from the nearest health facility, wealth index and postnatal care utilization after the previous birth were the determinants of suboptimal birth spacing.

Keywords: suboptimal birth spacing, Gedeo, reproductive age women

Introduction

Birth spacing is the duration between two successive births including the period of postpartum amenorrhea, the menstruating periods, and the following period of gestation.[1] To ensure maximum health benefits of mothers and newborns, inter-birth intervals should be three to five years.[2,3] World health organization (WHO) recommends a minimum of 24 months after a live birth-to-pregnancy and 33 months birth to-birth intervals to reduce adverse maternal, perinatal and infant outcomes.[4]

Birth spacing has been identified as an important life-saving measure for mothers and newborns.[3] Global findings revealed that short or suboptimal birth

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DovePress
http://doi.org/10.2147/IJWH.S252516

spacing results in an increased risk of maternal mortality and adverse pregnancy outcomes.[4–8] Short inter-birth intervals of less than 24 months are among the main predictors of increased risk of perinatal and infant mortality.[7,9-12] Promoting the length of inter-birth intervals for a minimum of two years results in the reduction of infant mortality by 50% in Ethiopia.[10]

Moreover, closely spaced births had a significant impact on population growth and undermining development efforts.[13,14] Although a lot has been done globally and nationally to control population growth, it continues with a high growth rate which is mainly attributed to the high fertility rate which in turn related to short inter-birth intervals.[14]

A significantly large proportion of women globally have been practiced short inter-birth intervals. For example, only 28% of women in Yazd, Iran spaced their births for 36–60 months.[15] The median inter-birth interval in Southern Jordan was 27.40 months.[16] The mean inter-birth interval in Baghdad, Iraq was 31.16 months.[17] About a quarter (24.6%) of women in rural Bangladesh had a short inter-birth interval.[5] Only 18% of mothers in Ghana spaced their births for 36–60 months.[18] The median inter-birth interval in Lemo district, Ethiopia was 33 months with the majority (57%) practicing short inter-birth interval.[1]

A variety of behavioral, socioeconomic, and cultural factors influence women's birth spacing practice. Marriage, postpartum in fecundability, contraception and induced abortion are known to determine inter-birth intervals. Demographic factors including women's education, employment, and the number and the sex of surviving children also play a role in determining child spacing.[5,17,19–21]

Special emphasis on the factors determining the practice of birth spacing for countries like Ethiopia with a high fertility rate is helpful to design evidence-based intervention strategies. Hence, this community-based unmatched case–control study was designed to identify the determinants of sub-optimal birth spacing among reproductive-age women in Gedeo zone, South Ethiopia.

Materials and Methods

Study Design and Settings

A community-based unmatched case–control study was employed from October 1 to November 30, 2018 in Gedeo zone, South Ethiopia. Gedeo zone is formed from 8 woredas and 148 kebeles, the smallest administrative unit, (13 Kebeles in towns and 135 kebeles in rural). Its administrative center, Dila, is 377km and 102km south of Addis Ababa, the capital of Ethiopia, and Hawassa, the administrative city of South Nations, Nationalities, and Peoples Regional State (SNNPRS) respectively. According to the 2007 Census conducted by the Ethiopian Central Statistical Agency, the zone has a total population of 847,434 and a population density of 699.84. A total of 179,677 households were counted in this Zone. According to the regional health office, the estimated total population in 2016/2017 was 1,112,951 of which 239,053 were reproductive age women (15–49).

Study Population and Sample Size

All randomly selected women in the reproductive age group who have at least two consecutive births in the last 10 years were included in the study. Cases were all randomly selected women in the reproductive age with short inter-birth intervals (< 33 months) whereas controls were all randomly selected women in reproductive age with inter-birth intervals of 33 months and more ie optimal birth spacing.

The sample size was calculated using EPI-Info version 7 statistical software. Under the assumptions of 90% power, 95% confidence level (CI), a case to control the ratio of 1:1, and 15.1% and 29.7% proportion of controls and cases in the poorest wealth index respectively taken from a study conducted in Arbaminch district.[21] The calculated minimum sample size for this study was 366. Considering the design effect of 2 and 10% non-response rate, it became 814. Hence, a total of 407 cases and 407 controls were recruited.

Sampling Procedures

A stratified, two-stage cluster sampling technique was employed. Initially, all administrative kebeles in Gedeo zone were stratified into town and rural. Then 2 urban and 21 rural kebeles were randomly selected. A preliminary survey of reproductive age women was conducted in each selected kebele to identify and locate cases and controls. The sample size was proportionally distributed for each selected kebele depending on the number of cases and controls. Each reproductive age women having two or more successive births living in one household were registered separately during the preliminary survey. Finally, cases and controls were selected from the respective source population by a simple random sampling technique using computer-generated random numbers.

The outcome variable was sub-optimal birth spacing. The predictor variables: Age, educational, occupation of the participants, family size, wealth index, number of total

pregnancies, number of total births, place of birth, Mode of birth, PNC use, contraceptive use and duration of EBF.

Birth spacing in this study was considered to be suboptimal or short when the duration between two successive births was less than 33 months and it was optimal when the durations were greater than or equal to 33 months. Mothers with suboptimal or short birth spacing were considered as cases and that of optimal birth spacing were controls.

Data Collection and Analysis

A preliminary survey of reproductive age women in the selected kebeles was conducted before the actual data collection. Data was collected using a pretested, structured, interviewer-administered questionnaire designed. A total of 10 trained data collectors and 2 supervisors were recruited for data collection. Throughout the data collection, data collectors were supervised, regular meetings were held among the data collectors, supervisors, and investigators. Two more additional visits were made for participants who were not available during the first visit. The collected data were reviewed and checked for completeness before data entry. Double data entry was made.

Data were checked, coded, and entered into Epi data version 3.1 and exported to SPSS (Statistical Package for Social science) version 22 for analysis. Wealth index (to represent the variables: farmland, electricity, mobile (cell phone), television, refrigerator, motorcycle, bed, cooking fuel, live stokes, bank account, chair, mattress, source of drinking water, the roof of the house, number of persons per living room) was computed using the principal component analysis. Descriptive statistics was employed to display the study findings. Bivariate and multivariable logistic regression analyses were computed to identify the determinants of suboptimal birth spacing. All explanatory variables with a p-value of less than 0.2 in the bivariate analysis were included in the multivariable analysis. Finally, statistical significance was considered at P value less than 0.05.

The ethical approval letter with Reff No IRB/018/10 was obtained from the Institutional Review Board (IRB) of the College of Medicine and Health Sciences, Hawassa University. It was presented to Gedeo zone health department to grant official permission to undertake research activities in the selected kebeles. Each participant provided written informed consent just before the interview. The study was conducted under the World Medical Association Declaration of Helsinki-Ethical Principles for Medical Research Involving Human Subjects.

Results

A total of 814 reproductive-age women were participated in this study making a response rate of 100%.

Sociodemographic Characteristics

The mean age of the participants was 32.17 years old with a range of 18 to 49 years old. About three quarters, 305 (74.9%), and 291 (71.5%) were protestant in religion respectively. Three hundred thirty-six (82.6%) of cases and 323 (79.4%) of the controls were from Gedeo ethnic group. Three hundred eighty-seven (95.1%) of the cases and 394 (96.8%) of the controls were in marital union during the time of data collection. Three hundred twenty-two (79.1%) of the cases and 276 (67.8%) of the controls were rural residents. The median age at marriage of the cases and controls was 17.63 and 18.0 years old respectively. Nearly two-third, 250 (61.4%) of the cases and about half, 215 (52.8%) of the controls were living within 20 minutes from the nearest health facility (Table 1).

Obstetrics and Reproductive Health-Related Factors

Three fourth, 269 (66.1%) of the cases and 249 (61.2%) of the controls gave their first birth before celebrating their 20th birth date. Though 271 (66.6%) of the cases and 327 (80.3%) of the controls had antenatal follow up for their former pregnancy, only 162 (39.8%) of the cases and 208 (51.1%) of the controls were assisted by a skilled birth assistant (Table 2).

Child and Child-Related Factors

A majority, 352 (86.5%) of the cases and 347 (85.3%) of the controls initiate breastfeeding for their previous child within an hour after birth. Only 17 (4.2%) of the cases and 12 (2.9%) of the controls' previous children were not alive during the data collection period (Table 3).

Determinants of Suboptimal Birth Spacing

After computing binary logistic regression analysis, participants' level of education, residence, age at first marriage, distance from the nearest health facility, Family size, wealth index, ANC for the previous pregnancy, Place of the previous birth, PNC use after the previous birth, prior discussions with husbands on the desired number of

Table 1 Sociodemographic Characteristics of the Participants in Gedeo Zone, South Ethiopia, 2018

Variables		Cases	Controls
Age	15–19	1(0.2%)	1(0.2%)
	20–24	37(9.1%)	36(8.8%)
	25–29	118(29.0%)	123(30.2%)
	30–34	100(24.6%)	102(25.1%)
	35–39	76(18.7%)	85(20.9%)
	40–44	58(14.3%)	42(10.3%)
	45–49	17(4.2%)	18 (4.4%)
Religion	Orthodox	60(14.7%)	89(21.9%)
	Muslim	19(4.7%)	7(1.7%)
	Protestant	305(74.9%)	291(71.5%)
	Catholic	13(3.2%)	13(3.2%)
	Others	10(2.5%)	7(1.7%)
Ethnicity	Gedeo	336(82.6%)	323(79.4%)
	Oromo	29(7.1%)	28(6.9%)
	Amhara	22(5.4%)	32(7.9%)
	Others	20(5.0%)	24(5.9%)
Educational status of the participants	Cannot read and write	166(40.8%)	124(30.5%)
	Can read and write	37(9.1%)	65(16.0%)
	Primary school	147(36.1%)	118(29.0%)
	Secondary school	40(9.8%)	60(14.7%)
	College and above	17(4.2%)	40(9.8%)
Occupation of the participants	House wife	220(54.1%)	173(42.5%)
	Merchant	127(31.2%)	134(32.9%)
	Gov't Employee	17(4.2%)	57(14.0%)
	Farmer	33(8.1%)	37(9.1%)
	Others	10(2.5%)	6(1.4%)
Age at first marriage	< 18 years old	155(38.1%)	179(44.0%)
	≥ 18 years old	252(61.9%)	228(56.0%)
Husband's educational status	cannot read and write	57(14.0%)	41(10.1%)
	can read and write	29(7.1%)	39(9.6%)
	Primary school	171(42.0%)	145(35.6%)
	Secondary school	95(23.3%)	80(19.7%)
	College and above	55(13.5%)	102(25.1%)
Family size	≤ 4	60 (14.7%)	78(19.2%)
	5–8	254 (62.4%)	240(59.0%)
	≥ 9	93 (22.9%)	89(21.9%)
Wealth index	Lowest quartile	94(23.1%)	180(44.2%)
	Middle quartile	119(29.2%)	151(37.1%)
	Highest quartile	194(47.7%)	76(18.7%)

children and duration of EBF were included in the final regression analysis model (Table 4).

On multivariable analysis, Women's educational status, AOR (adjusted odds ratio) (95% CI (confidence interval)) =0.6 (0.43, 0.96), age at first marriage, AOR (95% CI) =0.9 (0.85, 0.99), distance from the nearest health facility,

Table 2 Obstetrics and Reproductive Health Related Characteristics of Participants in Gedeo Zone, South Ethiopia, 2018

Variables		Cases	Controls
Age at first birth	<15 years	0(0%)	5(1.2%)
	15–19 years	269(66.1%)	249(61.2%)
	20–24 years	131(32.2%)	148(36.4%)
	25–29 years	7(1.7%)	5(1.2%)
Number of total pregnancies	1–3	112(27.5%)	140(34.4%)
	4–6	168(41.3%)	166(40.8%)
	7–9	99(24.3%)	75(18.4%)
	>9	28(6.9%)	26(6.4%)
Number of total births	1–3	116(28.5%)	145(35.6%)
	4–6	167(41.0%)	162 (39.8%)
	7–9	96(23.6%)	75(18.4%)
	>9	28(6.9%)	25(6.1%)
Place of former birth	In health facility	161(39.6%)	208(51.1%)
	Home	246(60.4%)	199(48.9%)
Mode of the former birth	Vaginal	398(97.8%)	396(97.3%)
	Abdominal	9(2.2%)	11(2.7%)
PNC* use after former birth	Yes	193(47.4%)	299(73.5%)
	No	214(52.6%)	108(26.5%)
Contraceptive use between the last two births	Yes	260(63.9%)	284(69.8%)
	No	147(36.1%)	123(30.2%)
	No	251(61.7%)	207(50.9%)
Information on birth spacing	Yes	281(69.0%)	311(76.4%)
	No	126(31.0%)	96 (23.6%)

Abbreviation: *PNC, postnatal care.

AOR (95% CI) =1.4 (1.04, 1.94), wealth index, AOR (95% CI) =4.1 (2.66, 6.19), and postnatal care utilization after the previous birth, AOR (95% CI) =0.4 (0.25, 0.53) were found to had statistically significant association with suboptimal birth spacing (Table 4).

Discussion

Mothers with primary school level of education in this study were less likely to practice suboptimal birth spacing than those who cannot read and write. This finding is consistent with 2016 Ethiopian Demographic and Health Survey (EDHS) report[22] and with reports of different studies conducted in Southern Ethiopia,[1] Illubabor zone, South West Ethiopia,[23] Ghana,[24] South Jordan,[16] and Manipur, India.[25] This is probably because education affects the reproductive decisions of women as it positively affects women's understanding and/or knowledge of contraception and birth spacing as well as their health-seeking behavior. In this study,

Table 3 Child and Child Related Characteristics of the Participants in Gedeo Zone, South Ethiopia, 2018

Variables		Cases	Controls
Number of alive children	1–2	62(15.2%)	76(18.7%)
	3–4	122(30.0%)	152 (37.3%)
	5–6	122(30.0%)	88(21.6%)
	7–8	64(15.7%)	68(16.7%)
	≥9	37(9.1%)	23(5.7%)
Child death in the family	Yes	87(21.4%)	66(16.2%)
	No	320(78.6%)	341(83.8%)
Sex of the previous child	Female	216(53.1%)	234(57.5%)
	Male	191(46.9%)	173(42.5%)
Breast feeding initiation time after the previous birth	Within an hour	352(86.5%)	347(85.3%)
	After an hour	55(13.4%)	60(14.7%)
Duration of EBF* for the previous child	<4 months	13(3.2%)	15(3.7%)
	4 −6 months	349(85.7%)	364(89.4%)
	≥7 months	45(11.1%)	28(6.9%)
Recent child birth planed	Yes	326(80.1%)	357(87.7%)
	No	81(19.9%)	50(12.3%)

Abbreviation: *EBF, exclusive breastfeeding.

57.24% of mothers who cannot read and write practice suboptimal birth spacing compared with 36.27% of mothers who can read and write, 40% of those with secondary education, and 29.82% of those with college and above education. Less education was also one of the major underlying factors of high fertility identified in Yemen.[28] Furthermore, this finding is supported by the notation "Educating females is educating the family."

On the other hand, a higher likely hood of practicing suboptimal birth spacing with better levels of women's educational status was observed in pastoral communities of southern Ethiopia,[20] Arba Minch District, South Ethiopia,[21] Zimbabwe[27] and Yazid, Iran.[15] This is probably because better-educated women passed much of their reproductive years on education and other related non-child bearing activities reduce childbearing into fewer years and hence have shorter inter-birth intervals than less-educated mothers. Education also influences the women's age at marriage after which many women started childbearing or fecundation.

In this study, age at first marriage was found to be a statistically significant determinant of suboptimal birth spacing. This finding is in line with studies conducted in Butajira, Ethiopia,[28] Uganda, and Zimbabwe[27] in which women with higher age at marriage were more likely to practice longer inter-birth intervals. A lesser likely hood of experiencing suboptimal birth spacing was also reported among women who started their reproductive life later in rural Bangladesh.[5] Early marriage was also one of the major factors underlying high fertility in Yemen.[29] Age at marriage is considered to be an important variable in the fertility process. If couples marry at a very young age, decisions on the number of children, use of contraceptives and the like may be made at a less mature age. As women get marriage at a mature age, they are started their reproduction with a better understanding of planning births and the risks of having subsequent births.

On the other hand, a significant decrease in the interbirth interval with increasing age at marriage was reported in Yazd, Iran, and South Jordan (15, 16), in Manipur.[25] Women who marry late are expected to quicken the pace of births because of the social pressure to prove their reproduction,[30] and/or to compensate for their missed reproductive age. Furthermore, Upadhyay reported a negative association between women's mean age at marriage and total fertility rate in his review of the literature.[31] Early marriage was also one of the major factors underlying high fertility in Yemen.[26]

A higher odds of practicing suboptimal birth spacing was observed among mothers in the poorest wealth quartile. This was consistent with study findings in Arba Minch District, Ethiopia,[21] Zimbabwe,[27] South Jordan,[16] and rural Bangladesh.[5] A 10.9 months longer birth intervals among women in the highest wealth quintile than among those in the lowest quintile were reported in EDHS 2016.[22] This is probably because socioeconomically disadvantaged women were more likely to have frequent births[5] as they may have less access for education and health care as well as less understanding of the risks and benefits of frequent births.

However, a higher likelihood of practicing short birth interval was noticed among women in the highest wealth quartile in Lemo district, southern Ethiopia[1] and Illubabor zone, South West Ethiopia.[23]

A lesser likelihood of practicing subsequent short interbirth interval was observed among mothers who utilized post-natal care than their counterparts who did not use. This is probably because these mothers have the chance to be counseled about birth spacing and contraception and the timely use of contraceptive methods. They also have a chance to have a better understanding of newborn and infant feeding and health care practices to prevent premature weaning and infant death which could, in turn, extend subsequent births. They might also have better health-seeking behavior for themselves and their newborns and infants.

Table 4 Bivariate and Multivariable Analysis of the Determinants of Sub-Optimal Birth Spacing in Gedeo Zone, South Ethiopia, 2018

Variables		Case	Control	COR (95% CI)	AOR (95% CI)
Educational status of the participants	cannot read & write	166	124	1.00	1.00
	can read and write	37	65	2.4(1.48, 3.74)	1.2(0.69, 2.07)
	Primary school	147	118	1.1(0.77, 1.50)	0.6(0.43, 0.96)*
	Secondary school	40	60	2.0(1.26, 3.19)	0.9(0.48, 1.57)
	College and above	17	40	3.2(1.71, 5.82)	1.3(0.64, 2.78)
Residence	Rural	322	276	0.6(0.41, 0.76)	0.8(0.54, 1.14)
	Town	85	131	1.00	1.00
Age at marriage		407	407	0.9(0.88, 1.00)	0.9(0.85, 0.99)*
Distance from the nearest health facility	≤20 minutes	250	215	1.00	1.00
	>20 minutes	157	192	1.4(1.08, 1.88)	1.4(1.04, 1.94)*
Family size		407	407	0.9(0.88, 0.99)	0.9(0.87, 1.02)
Wealth index	Lowest quartile	94	180	4.9(3.40, 7.04)	4.1(2.66, 6.19)**
	Middle quartile	119	151	3.2(2.27, 4.63)	3.2(2.21, 4.77)**
	Highest quartile	194	76	1.00	1.00
ANC for the previous pregnancy	Yes	271	327	1.00	1.00
	No	136	80	0.5(0.35, 0.67)	0.95(0.62, 1.46)
Place of birth for previous child	In health facility	161	208	1.00	1.00
	Other than health facility	246	199	0.6(0.47,.83)	1.3(0.92, 1.93)
PNC use after the previous birth	Yes	193	299	1.00	1.00
	No	214	108	0.3(0.24,.44)	0.4(0.25, 0.53)**
prior discussions with husbands on the desired number of children	Yes	156	200	1.00	1.00
	No	251	207	0.6(0.49, 0.85)	1.119
Duration of EBF		407	407	1.1(0.99, 1.22)	1.1(1.00, 1.25)

Notes: ** P < 0.01 * P<0.05 1.00 reference.

Likelihood of practicing suboptimal birth spacing increases among mothers living beyond 20 minutes from a health facility. As the distance from health facilities increases, the probability of accessing maternal health care services including prenatal care, intra, and post-natal care services where mothers could be counseled for birth spacing and contraception as well as getting better contraceptive methods to become difficult. This could be further explained in EDHS 2016 in which shorter inter-birth intervals were reported among rural women than urban women.[22] Geographical inaccessibility of reproductive health care services was also reported as one of the major barriers to adherence to optimal birth spacing in a qualitative study conducted in Arbaminch district.[32] A similar finding was also reported in studies conducted in India.[25,33]

Having information on birth spacing and contraception was found to be a statistically significant determinant of suboptimal birth spacing. Lack of information about the benefit of contraceptives and fear of side effects of contraceptives was reported as one of the reasons to practice short inter-birth intervals in Arba Minch Zuria district.[32] Higher fertility was also reported among women who did not know their fertility period.[28]

Conclusion

Maternal educational status, age at marriage, wealth index, postnatal care utilization, and distance from the nearby health facility were statistically significant determinants of suboptimal birth spacing. Improving the maternal level of education, accessibility, and utilization of maternal health services were recommended.

Acknowledgments

Above all, we would like to express our appreciation to Hawassa University college of Medicine and Health Sciences for continuous support and follow up. Our heart

full thanks also go to the SNNPRS Health Bureau, Gedeo Zone Health Department, and Kebele Administrative Offices for the provision of the required information and their full courage and assistance. Finally, we would like to acknowledge our study participants for their cooperation.

Disclosure

The authors report no conflicts of interest in this work. There is no funding organization for this work.

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